

The Imitation Game, The Language Game, The Learning Game and the Moving Game

1. Search and find three definitions of AI, describe these briefly. Make references. Discuss definitions relative to discussions of AI in the course.

The Merriam-Webster dictionary defines artificial intelligence as “a branch of computer science dealing with the simulation of intelligent behavior in computers”. (*Artificial Intelligence*, n.d.) This definition is quite general, but is useful in that it gives a basic insight into what AI is.

“AI is a subfield of computer science aimed at specifying and making computer systems that mimic human intelligence or express rational behaviour, in the sense that the task would require intelligence if executed by a human” (Russel & Norvig, 2010 in Bratteteig & Verne, 2018).

I find this definition quite extensive, and it covers many of the things discussed in the course. This definition of AI leans towards the understanding of AI as artificial narrow intelligence, perhaps with the goal of simulating a more “human” intelligence, which would be artificial general intelligence.

The English Oxford Living Dictionary defines AI as: “The theory and development of computer systems able to perform tasks normally requiring human intelligence, such as visual perception, speech recognition, decision-making, and translation between languages.” (*Artificial Intelligence*, n.d.)

I think this definition is a bit misleading in that it defines “visual perception” and “decision-making” as requiring human intelligence. These are tasks that some animals can perform, and while I might understand the intention of the definition is not to separate these abilities between human and animal intelligence, it makes it seem like these would require some “generally intelligent” intelligence, while artificial narrow intelligence can complete these tasks even better than some humans.

2. Search and find three definitions of Robotics, describe these briefly.

The Merriam-Webster dictionary defines robotics as “technology dealing with the design, construction, and operation of robots in automation”. (*Robotics*, n.d.)

As with the definition of AI, the dictionary definition of robotics gives basic insight into what the field is about. I feel like this definition is lacking in that it doesn't touch on robotics as a field of study, but defines the phrase only as the technology in itself.

Another very similar definition comes from the English Oxford Living Dictionary, which defines robotics as: “The branch of technology that deals with the design, construction, operation, and application of robots.” (*Robotics*, n.d.)

Again, the definition does not discuss the field of study, although it does include “application”, which could mean discussions on how and where robots might be in use.

NASA gives a definition aimed at children on their website: "Robotics is the study of robots. Robots are machines that can be used to do jobs. Some robots can do work by themselves. Other robots must always have a person telling them what to do." (May, 2009).

I actually enjoy this definition. It is obviously aimed at children, and therefore worded very simply, but it sums up that robotics is a field of study of robots, and that robots are machines that perform tasks. It even specifies that some robots are more autonomous than others.

3. Search and find three definitions of Machine Learning, describe these briefly. Discuss definitions relative to discussions of Machine Learning in the course.

Arthur Samuel, who is credited with coining the phrase in 1959, defined machine learning as the "field of study that gives computers the ability to learn without being explicitly programmed" (Munoz, 2014).

Finding sources for this exact wording was difficult, so the reference could be approved upon. I find the definition leaves something to be desired, as it contains phrasing that is not defined. What does it mean that a computer has "the ability to learn", and how does this happen without it being "explicitly programmed"? I find myself thinking that surely the code needs to contain specifics on how the computer is supposed to learn, but that maybe the computer is then able to apply that code to several situations, and expand on its ability to learn over time. In class we have discussed how machine learning happens through the use of neural networks, and how the architecture and set-up of the network is crucial to how well machine learning works. So the programming has to be very specific, in order for the system to give an appropriate output, and I don't think this is reflected in the definition.

Wikipedia defines machine learning as: "a field of computer science that uses statistical techniques to give computer systems the ability to "learn" (e.g., progressively improve performance on a specific task) with data, without being explicitly programmed" (*Machine Learning*, n.d.)

The definition is based on Samuel's 1959 definition (from Munoz, 2014), but adds that machine learning is a field within computer science that utilizes statistics. In general the definition is quite useful, in that it expands and gives some academic context to Samuel's definition. It does come across as more of a colloquial definition rather than an academic one, and I find myself wondering at the definition of "computer systems". In relation to what we have learned in class, the definition seems sound, but quite "general", and I wish it touched on or mentioned learning through large datasets and neural networks.

The English Oxford Living Dictionary defines machine learning as: "The capacity of a computer to learn from experience, i.e. to modify its processing on the basis of newly acquired information." (*Machine Learning*, n.d.)

I like that this definition specifies that the computer "learns" by taking in new information, and then changes its processing. The definition is a simple one, as dictionary definitions are wanted to be, but I still think it's useful in communicating the basic concepts of machine learning. Like the other ones, I think this definition is relevant to what we have discussed in class, although what we have discussed in class is more technical and specific.

4. Write in three to five sentences the relationship between AI and Robotics as you understand this.

The best way to describe how I view the relationship between AI and Robotics would be by describing them as “mind” and “body”. AI is a field concerned with computer learning and decision making, trying to emulate a human, or at least intelligent, mind. This does not need to involve any perception of, or movement in, physical space. Robotics is a field concerned with robots, which I understand as physical objects usually involving sensors and movement, like a “body”. AI and robotics can exist independently of each other, but can also be combined in autonomous robots.

5. Make a text to describe your own definition of AI. Explain briefly this definition. Expand on this text to explain the relation between AI and Machine Learning.

I understand AI as a field within computer science that aims to recreate certain aspects of human intelligence, so as to simulate human decision-making, conversation etc. In order to create computer systems that can achieve this machine learning can be applied. You could recreate certain human behavior without machine learning. In our group project we prototyped a chatbot that would recognize some predetermined phrases, and then give a predefined response. This would simulate a human conversation, but would be very limited. Making these categories and classifying information to fit them is extremely time-consuming, and so utilizing machine learning to process information greatly expands the capabilities of an AI.

6. Make a drawing of an interaction with an AI - something that you imagine. Describe with some sentences your drawing. Summarize key characteristics of interaction design for AI-based systems (challenges, principles, trends). Sketch a user interface illustrating one or more of these characteristics.



The drawing is inspired by the movie *Her* (2013), described in task 10. In the movie there is an omni-present OS that interacts with technology in the main characters home and life. The OS sometimes does things that the main character does not ask it to do, but that is “for the best” for the person, such as sending samples of their writing to a publishing company. In the movie this works out great, but it inspired me to think about how an AI would make choices in my life that were good for me, but maybe not what I wanted. I imagine such an AI as both being helpful, but also annoying. I feel like the more agency and control an AI of this nature would have, the more control it might take away from a human.

The challenges of interaction with AI-based systems today often occur when the AI does not conform the following maxims presented in the second lecture on interaction with AI (Følstad, 01.10.2018):

Maxim of Quantity: Be as informative as required

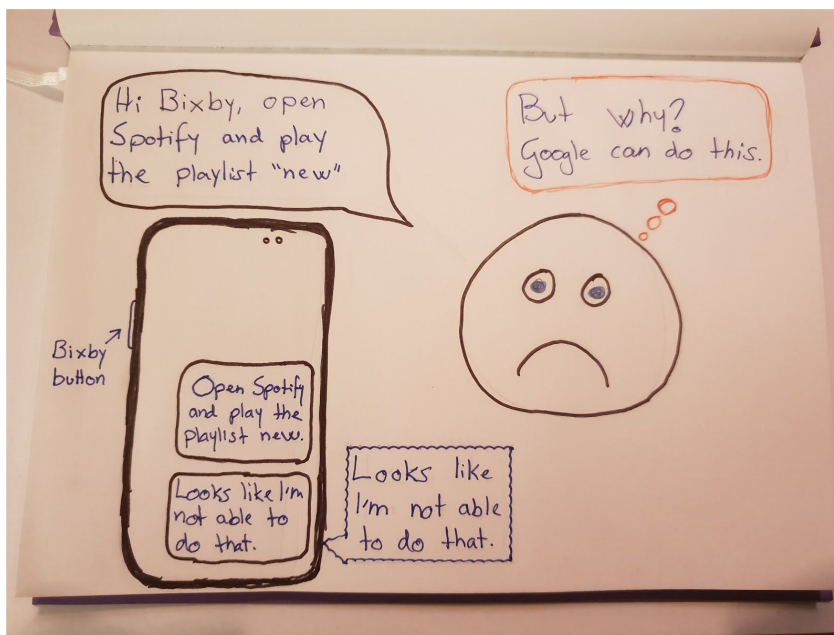
Maxim of Quality: Speak what you believe is the truth

Maxim of Relation: Be relevant

Maxim of Manner: Be clear and unambiguous

When interacting with Bixby on my Samsung phone, I find it often struggles with being relevant, and doesn't really give a relevant answer to what I asked, or it does something which is not what I asked for. This would be an example with the challenge with the maxim of relation.

AI in general is very trendy these days, and I think it has become somewhat of a buzzword used to describe many things. Some of the typical uses of AI are chatbots of all sorts, use of natural language processing for speech interfaces, “personal assistants” such as Siri and Bixby (for smartphones) and Alexa and Echo (for smart-home devices). The use of machine learning, especially in image and audio pattern recognition, is very popular in the health sector. AI is also used in other fields, such as architectural and urban planning in the company Spacemaker, and in game development, financial analytics and general customer service.



Above is a drawing of me using Bixby on a Samsung phone in an effort to turn on a playlist on Spotify. This is a speech interface, where I push the Bixby-button on the side of my phone to make it "listen". It then shows on the screen what it thinks I said, and gives me a response, both written on the screen and out loud. The interaction is clear (maxim of manner), it is relevant to what I asked it to do (maxim of relation), it tells what it believes to be the truth (maxim of quality) and the reply is short (maxim of quantity). However the reply is too short for my liking, as I would like it to tell me why it cannot do what I asked. Does Bixby not have access to Spotify? Can it not find the playlist? Does Spotify not support certain functionality in Bixby?

7. Read the article: "On the Subject of Objects: Four Views on Object Perception and Tool Use" by Tarja Susi / Tom Ziemke. Write in your own words one page about the different perspectives on the human relationship with tools.

The article by Susi & Ziemke (2005) outlines four different perspectives on the relationship between subjects and objects. These perspectives are usually concerned with the relationships that humans have with the world that surrounds us and the objects we interact with, but the authors argue that these perspective can also shine a light on how artificial intelligence robots (subjects) interact with its environment (objects). This would make these perspectives relevant and useful also in the 21st century, in the emerging research of robots as agents.

Functional tone - Jakob von Uexküll

Uexküll was a German biologist and a subscriber to Kant's theory that knowledge of the world is gained through an individual's perception of their surroundings. When observing an unknown object a person can have a *reseptor image* of the object, meaning they can perceive its shape, size etc. However, the object does not become meaningful (a *meaning-carrier*) until it gains a *functional tone* (an understanding of the function and use of the object). An object is therefore given meaning when observed and comprehended as having a relation to the subject though a given function or use. A single object can have several functional tones and change between them depending on an individual's need. A stone can be used to step on, to throw, to plug a hole in a stone wall etc., and through the subjects perception, the object changes.

Equipment - Martin Heidegger

Heidegger was a German philosopher, and his theories on humans relation to tools overlaps with Uexküll's understanding of objects with meaning. According to Heidegger however, the subject (human) and object (tool) cannot be reasonably separated or differentiated, as they both are considered and defined based on their existence in the world. A non-human (an object) is considered *equipment* as it is a thing that is useful. What separates Heidegger's equipment from Uexküll object with a functional tone is that equipment's usefulness is not independent of context and learned norms of how to interact with the equipment. This is because equipment is connected with other equipment, and its usefulness changes depending on the context of other useful things and the situation in which it is used.

Affordance - James J. Gibson

American psychologist Gibson perceives the dichotomy of object and subject to be false, and focuses instead in the *affordance* the environment presents to an animal. The affordance is what

the environment can offer an animal. Unlike Uexküll Gibson's presents that affordance does not change based on an animal's perception of its environment, rather the shape, form, senses and location of the animal changes its perception of the affordance. For Gibson a tool is a separate type of object with specific attributes: it is "graspable, portable, and can be manipulated." Tools are also unique as they can be temporarily attached to animals, and enhance their capabilities. Like Heidegger Gibson believed that tools and their use can depend on social norms, and that understanding the use a tool can be improved by learning from others.

Entry point - David Kirsh

Kirsh is a Canadian cognitive scientist, who works with cognition in a work context, usually an office space. Kirsh believes that human interaction with their environment can change the *cognitive congeniality* of the environment, through restructuring and changing to make the environment more hospitable to us. There are two approaches to this restructuring, one of which is referred to as deforming the topology, which can be done by introducing or changing the tools used. The second is to increase cognitive congeniality by using external objects (external to the mind) to help with cognitive burdens. This can include our fingers when counting, but also pens, paper etc. These objects then become helpful tools to us. One such type of tool is an *entry point* - an object that invites us to enter "an information space" or a task. A typical example would be a post-it note with a reminder, or a calendar.

8. Select one of the perspectives from the article, and go into detail when you describe it.

Continuation of task 7, paragraph five:

According to Kirsh an entry point has certain characteristics that influence how humans interact with it, shortly summarized as:

- Intrusiveness: how attention-grabbing is the object
- Richness in metadata: how much data does the object hold
- Visibility: how visible and distinct is the object
- Freshness: has the entry point recently been used or touched
- Importance: how relevant or urgent is the task associated with the entry point
- Relevance: how relevant or useful is the entry point to the current activity

The last two of these characteristics are subjective, and therefore dependent on the human/user/observer of the entry point. This means that not all entry points mean the same to all humans. The use of entry points as a tool gives structure to tasks, which could improve people's performance by reducing the cognitive demands of office work.

9. Select one other article from module 1, and write with your own words what this article is about.

Does AI make PD obsolete? Bratteteig, T. & Verne, G. (2016)

The article is about whether artificial intelligence makes participatory design obsolete. An AI uses huge sets of statistical data to make decisions or suggestions for users, and are often

viewed as making a customized choice, or providing an individual experience, for each user. This is because it learns from the users' (and sometimes many users') use of the AI. Participatory design aims to provide users with tools and techniques to design systems that would fit their needs. If the choices/suggestions/decisions of an AI is based on the actual use of the system, and the user therefore could mold the system to fit their needs, does this mean PD is no longer needed?

The authors argue that AI provides challenges to PD, but that many parts of PD could be useful when designing systems that utilize AI. This would involve a good understanding of how AI works, both for users and designers, including limitations of AI, such as the fact that AI changes over time. This would also mean that design and evaluation of AI-systems would need to be made with the future in mind (how will this system change as it evolves?). Because AI changes with use, it would also be important for designers and users to think about how training of AI is performed. Users would need to understand how AI's learn, and designers need to be aware of how the responsibility of training an AI could limit the use of the system.

10. Select one documentary or a fictional film, book or game: describe with your own word how interaction with AI is portrayed in this work.

The feature film *Her* (2013) is an imagination of a near future where an AI operating system (OS) personalized for each user, called OS1, has just been launched. We follow professional letter-writer Theodore (Joaquin Pheonix) as he purchases, and begins interacting with the OS Samantha (voiced by Scarlett Johansson). Samantha interacts with Theodore through a spoken interface, but being his OS she is also omnipresent on his version of a smartphone, and in his calendar, email etc. They eventually develop a romantic and sexual relationship, and Theodore introduces Samantha as his girlfriend to close friends and colleagues.

Interestingly Samantha does not have any kind of physical avatar, nor is she connected to any robotics that would enable her to interact with physical space - she is simply "the voice in his computer". The film explores themes of connection and relationships, both between humans, and between humans and AI. How do we live together, learn from each other and evolve as consciousnesses (both human and otherwise)? The film is interesting from an AI standpoint because it imagines "realistic" issues that could arise in a relationship between an autonomous non-human intelligence and a normal person - such as whether Samantha exists for herself or for others. Is she a personal assistant, an OS, a friend, a lover, some combination of the aforementioned, or perhaps neither? What are the ethics of being emotionally involved with an AI, and should it be treated like a real person? And what happens when the AI has needs and capabilities that evolve beyond human comprehension?

Ultimately the film is a somewhat sad, but beautiful reflection on what it means to be "alive" and connected to others.

11. Describe what you understand by autonomy; both human autonomy and machine autonomy.

I understand human autonomy as the capability and ability to make decisions regarding one's own life. Realistically I think these decisions are often influenced by factors around us, both

known and unknown to us, but human autonomy ultimately boils down to being able and having the freedom to make one's own decisions.

I understand machine autonomy to relate to a machines "independence" in some way. This could mechanically mean simple actions or movements that happen without or with limited human involvement, such as a watch. In terms of robotics and AI I understand it as a decision making process, where the AI or robot can make a decision and act on it in a given situation, without being told by a human what to do.

12. When was the term "AI" first coined? Please make a reference.

The term AI was first used in 1956 by John McCarthy at an academic conference covering the subject (Smith, McGuire, Huang & Yang, 2006).

13. Articulate one question for the article "What we talk about when we talk about context" by Paul Dourish in the curriculum.

If users, not designers, determine the meaning of the technologies they use, how can we design good solutions for typical non-technology users, such as old citizens who refuse to use, or don't understand, government websites?

14. Articulate one question for any other article in the curriculum.

Bratteteig, T. & Verne, G. (2016) *Does AI make PD obsolete?*

How can PD be used in the training of an AI, and could it be used to develop training material?

15 a. Read the article: "Like Having a Really Bad PA" by Luger & Sellen. Summarize in your own words key lessons learnt for interaction design with dialogue systems. Discuss the relevance of these lessons learnt for interaction with AI-based systems in general (1/2-1 page).

The paper explores interaction with conversational agents (CA) through interviews with 14 different users. The conclusion of the paper is that there is a difficult gap between the users' expectations of conversational agents and what the CA can actually perform. In general the users struggle with gauging the intelligence of these systems, and they have poor mental models of CAs. The users seem to exhibit a lack of trust in the systems, and did not trust them to do complex or sensitive tasks. Based on the study the authors pinpoint four areas of consideration when designing for conversational agents:

1. Consider ways of revealing the intelligence of the system
2. Reconsider the use of humour in conversational agents
3. Clearly indicate the capabilities of the system
4. Orient the design of the CA around the dominant use case

These lessons are meant for interaction with conversational agents, and could therefore be applicable for other dialogue systems, including various forms of chatbots. Some of the issues that arose in the study are more typical of these kinds of interfaces, such as the use of humour.

Humour is rarely part of other types of interaction with AI, and I think that is a good thing. I would not want my image pattern recognition system for cancer detection to crack jokes with me while I worked, nor would I want my financial statistics and predictions served with a side of silly puns. Apart from that, the lessons learned in this study seem to be relevant to interaction with many types of AI-systems.

Indicating the intelligence and the capabilities of a system could make the system more trustworthy. If I knew what an AI could and could not do, maybe indicating that with a gauge of accuracy, I might be more inclined to trust the system if I knew I was using it correctly, or that it had plenty of training doing what I wanted it to do. In the early phases of AI (which I would argue we are in now), designing an AI-based system around a specific use case would limit how complex the AI needed to be. With enough computing power, good training material and a sophisticated machine learning system, future AIs might be capable of doing “everything”. For now I would however prefer to have well-developed systems that could deliver of the specific task they were made to do. I would want my smart-home device to be able to understand me, and perform tasks like turning off/on the light, or locking doors. I don't need a self-driving car to be an amazing conversationalist, I would rather it made safe decisions in traffic.

16. Describe with your own words what you understand by different levels of automation? What are the advantages/disadvantages related to higher/lower levels of automation? (1/2 – 1 page).

Different levels of automation pertains to how tasks that traditionally were performed by humans are being automated. The move towards automation includes use of tools and machines in production and industry, and has been happening for a long time. It includes not only tools for large-scale industrialisation, but also the use of draft animals and more primitive equipment to help perform labour-intensive tasks.

In modern day society we usually refer to the use of robotics and AI when discussing levels of automation, and how these can be more than just tools, but also members of a working team. Many career paths are now being partly automated, which has both advantages and disadvantages. Some people are afraid that their job security is at stake if high levels of automation at their workplace means they are no longer needed. Many other people are thankful for a certain level of automation, freeing up time to work on things they find more engaging.

Sheridan et al (1978) outlines 10 levels of automation for human-computer decision making, where level 1 indicates a low level of automation meaning that humans make all decisions. Level 10 on the scale indicated a very high level of automations, where the machine has complete autonomy and ignores humans. Most systems would exist somewhere in the middle, ranging from low-level autonomy to decision support systems, to almost fully automated systems that would still open for human intervention. The choice of level of automation is usually based on a combination of risk assessment and human/AI capabilities.

In situations where automation improves the productivity and capabilities of humans, a high level of automation could be beneficial for both the individual employee and society as a whole.

If however the level of automation makes people bored, unhappy, unattentive or in the worst case scenario obsolete, one has to weigh productivity against risk/safety. One possible solution is to reconsider task allocation and consider adaptive automation.

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